Rev. prod. anim., 25 (1): 2013

Efficacy of Three Anti-helminthics against *Macracanthorhynchus hirudinaceus* in Private Farm Swine

Kenia Milagro Sebasco Rodríguez, Darién Nápoles Vega, Juan Diego Mencho Ponce y Yunaisy Guerra Llorens

Faculty of Agricultural Sciences, University of Camagüey, Cuba

kenia.sebasco@reduc.edu.cu

ABSTRACT

Three antihelminthic agents were evaluated to treat swine infested by *M. hirudinaceous* in a private cooperative. Feces were sampled out of 215 swine between the ages of 4 and 10 months and processed by the sedimentation helminth-ovoscopic technique to find out animals infested by this acantocephalid. Parasite-infested swine were distributed in three groups with 50 individuals each. Group 1 received a weekly intramuscular dose of levamizole at 10 %; group 2 was also weekly treated with a subcutaneous dose of ivermectin at 1 %; and group 3, was orally administered Praziquantel every week. The data were processed by the statistical package SPSS (version 15.0). Two independent samples were applied Mann-Whitney´s non-parametric U test to detect treatment interrelation. Frequency results were graphically expressed in percents. The prevalence ratio was 69,7 %. The three anti-helminthic agents were effective; however, ivermectin and Praziquantel reached higher null-infestation percentages with only one dose compared to levamizole. A follow-up study comprising P.M. examination of swine is recommended.

Key Words: *cestode, parasiticides,* Macracanthorhynchus hirudinaceous

INTRODUCTION

Gastrointestinal parasitosis is produced by helminths (nematodes, cestodes and protozoans. It is a threat to domestic animals, as it causes anorexia, loss of blood and plasmatic proteins from the intestinal tract, protein metabolic disorders, mineral loss and depression in the activity of some intestinal enzymes, and diarrhea (Rodríguez *et al.*, 2001).

Ortega (2002) pointed out that the prevalence and economic effects of parasitic diseases vary depending on the management system, lodging characteristics, hygiene, geographical area for exploitation and age of pigs. These variables have an influence on the basic requirements and transmission mechanisms; as well as on the immune response of the host.

Pigs are a great reservoir of parasitic agents like *Trichinella* sp., *Cisticercus cellulosae*, *Balantidium coli*, *Toxoplasma*, *Ascaris suum*, *Diphyllobothirum* sp., and *Macracanthorhynchus hirudinaceus* (Nilles-Bije and Rivera, 2010).

Macracanthorhynchus hirudinaceus belongs to *Phylum Acanthocephala* and causes macracantosis, a parasitic disease which mainly affects pigs, and it is spread in temperate and tropical areas (Drugueri, 2005).

Currently, there is a wide range of anti-parasitic medication to manage different parasitic taxonomic groups affecting pigs, except *Macracanthorhynchus*, for which there is no specific anti parasite. It is an acantocephalous with high prevalence in tropical countries, mainly around animals raised extensively (Upton, 2004).

The aim of this research is to evaluate three antihelminthics against *Macracanthorhynchus hirudinaceus* in privately raised pigs.

MATERIALS AND METHODS

This work was carried out between September and December, 2011, at the Credit and Services Cooperative (CCS) made up of 98 farms, located on both sides of the road to Vertientes (a municipality of Camagüey province, in Cuba) from km 7 to km 18.

Randomly, 215 private backyard pigs between 4 and 10 months old were sampled.

Rectal swabs were applied to each pig in order to stimulate droppings and collect fecal material in previously labeled bottles. The goal was to detect *Macracanthorhynchus* parasite-infested animals.

The fecal samples were analyzed at the Parasitology Lab at the University of Camagüey, using the helminth-ovoscopy sedimentation technique described by Rodríguez *et al.* (1987). A Novel microscope with 20 x magnification was used for observation.

To evaluate the efficacy of antihelmithics the healthy animals were discarded. The infestation level was qualitatively evaluated according to Demedio *et al.* (1984):

- Null infestation: fecal samples where non dispersed forms, or adult specimens of *Macracanthorhynchus* were observed.
- Low infestation: Feces containing 1-10 eggs per observation field.
- Moderate infestation: Samples with more than 10 and up to 20 eggs per field of observation.
- High infestation: Feces with more than 20 eggs per field of observation.

Three groups of pigs were chosen at random, each with 50 infested animals. Each group was given antihelminthics as described below:

Group 1: treated with levamizole at 10 %. The first dose was intramuscularly administered, once a week, using 10 mg/kg of gross weight. The procedure was repeated 21 days after the first application.

Group 2. Ivermectin (Labiomec®, 1 %) was administered a single 300 µ/kg dose subcutaneously.

Group 3. Praziquantel was administered orally in a single 5 mg/kg dose. The animals remained fasting for two hours before receiving the application.

A week after the last application of levamizole, fecal samples were collected in order to detect animals infested with *Macracanthorhynchus*.

The data were processed with SPSS 2006 (version 15.0). Mann-Whitney´s non U parametric test was applied for two separate samples in order to detect the relationship between the treatments. The frequency results were expressed in percentages through graphs.

RESULTS AND DISCUSSION

The total number of pigs studied was confirmed to have been infested by *M. hirudinaceus (*69.7 %). Baletta *et al.* (2011) reports that *Macracanthorhynchus* is one of the most easily found parasites in the pig.

De la Fe *et al.* (2007), diagnoses parasite species with zoonotic relevance, such as *Ascaris suum*, *Balantidium coli* and *M. hirudinaceus larvae.*

In general terms, this acanthocephala is considered to have high prevalence in swine raising (Solaimany-Mohammadi *et al.,* 2003), mainly in the extensive handling system where animals have access to intermediate hosts (cockroaches and beetles), a condition that leads to re-infestations in herds. Upton (2004) says that *M. hirudinaceus* females can lay up to 80 000 very resistant eggs which are spread in the medium through several different coprophage animals and carrier hosts.

The characteristics of the exploitation system leading to re-infestations by the acantocephalous are present in the CCS where this research took place. At the site Pérez (2009) reported infestations by *Macracanthorynchus* 80 % of the animals. However, this percentage has decreased in the last two years, as evidenced in the results of this study, which may be related to the application of efficient antihelmithics, and the interruption of the parasite´s biological cycle by using concrete flooring.

Table 1 shows that Labiomec and Praziquantel are not significantly different ($P < 0.05$), perhaps due to the pharmacodynamic characteristics of the two drugs.

Fig. 1; 2 and 3 show that the three antiparasitic medications mean infestation was reduced and 16 a 28 % of animals treated were not infected, which shows the efficacy of the chemical principles against the genre.

Lapage (1983) reports that acantocephalous are worms previously classified within the nematode group because of their cylindrical shape. However, they differ a lot, and they have been associated to cestodes in some studies. Morphologically, the genre of this parasitic group includes a proboscis that penetrates the tissue of the host, which is not eaten, but serves as a support. This structure is similar to suckers and hooks present in *Taenias*, and similarly, they do not have a mouth, anus and digestive tract, so they are fed by neighboring substances absorbed through epidermis. Unlike cestodes, epidermis is thicker and beneath it there is a non-cellular layer similar to nematode hypodermis.

Before the taxonomic dilemma, this group was classified in a separate class: archiacantocephala; an intermediate stage between nematodes and cestodes. Its similarity to other groups may be the reason why the anthelmithics evaluated were efficient for its control.

Also, the action mechanism on nematodes, described by Labiofam (2002), reveals that this antiparasitic has immunomodulating effects (Vega,

2004), which is favorable to animals infected by *M. hirudinaceus* and other groups, like protozoan (Pomajbíková *et al.*, 2010).

Levamizole stimulates phagocytic activity of macrophages and neutrophils, mainly in animals with decreased T lymphocyte activity. Sánchez *et al.* (2004) express that the immunity development in the host is important for the control of parasites, considering that they are mostly self-limiting diseases.

Likewise, the active principle of Labiomec® is ivermectin, whose action mechanism is similar for 300 species of endo and ecto parasites, like nematodes and acarids (Shoop y Soll, 2002), which favors its use on *M. hirudinaceus*.

Parenteral application of ivermectin secures spreading all over the organism, reaching even, the fat deposits and less vascularized tissues (Arends and Vercruysse, 2002). As a result, high levels of the drug were observed in the plasma, 25-28 day residual activity, (Gupta, 2007); hence, the treatment costs are reduced by frequent dosages.

The morphological similarity of *Macracanthorynchus* to cestodes explains the efficacy of Praziquantel. Pérez (2006) and Olivares *et al.* (2010) indicate that the elimination of this antihelminthic is produced through the intestinal mucosa and the bile. As explained before, this genre sticks to the small intestinal mucosa and absorbs the nutrients around it, including antiparasitic drugs released, like Praziquantel; thus the need of a fasting period in the pigs that receive this treatment. This procedure favors drug absorption and secures more plasmatic concentration and bio availability of the product, as reported by Rubilar *et al.* (2001). It also requires less frequent dosages of the drug.

Currently, the strategy to kill parasites used by most breeders is empirical: they are unaware of dosages, the antiparasitic spectrum and prepatence periods in the different parasitic taxonomic groups. As a result, antiparasitic treatments are often fruitless. There is also another group of farmers that use non-validated antiparasitic home remedies, and these conditions usually favor the appearance of clinical symptoms of the disease. Macracantosis (Drugueri, 2005) is clinically manifested with enteritis, leading to deficient feed conversion. Non of the pigs investigated at the CCS showed symptoms compatible to this syndrome. Though the prevalence of the parasite decreased regarding the reports by Perez (2009), the carriers played their role spreading out the parasite with the ensuing infestation of other individuals, as well as displacement to other areas of the province due to the purchase of infested pigs.

CONCLUSIONS

The three antihelmithics assessed: levamizole, ivermectin and Praziquantel are efficient against *M. hirudinaceus*.

Ivermectin and Praziquantel produced higher percentages of null infestation than levamizole, with the single administration.

RECOMMENDATION

To prolong the study to the animal necropsy.

REFERENCES

ARENDS, J. y VERCRUYSSE, J. (2002). The Use of Macrocyclic Lactones to Control Parasites of Pigs. En J. Vercruysse y R. S. Rew (Eds). *Macrocyclic Lactones in Antiparasitic Therapy*. New York: CABI Publishing.

BALETTA, L. C.; MOJICA, M. C.; PALACIOS, A. M.; GUZMÁN, B.; BOTIA, W. O. y LOZADA, S. E. (2011). *Identificación de* Macracanthorhynchus hirudinaceus *en cerdos criollos sacrificados en el municipio de Arauca-Colombia*. Extraído en marzo de 2011, desde http://www.engormix.com/MA-porcicultura/sanidad/articulos/identificacion-macracanthorhynchus-hirudinaceus-cerdos-t3039/165-p0.htm.

DE LA FE, P.; BRITO, E.; AGUIAR, J. y RODRÍGUEZ, J. A. (2007). Estudio de la prevalencia de las endoparasitosis que afectan a los cerdos en el territorio de Cuba. *REDVET Rev. Electrón. Vet.*, *VIII* (4). Extraído en mayo de 2009, desde http://www.veterinaria.org/revistas/redvet/n040407.html.

DEMEDIO, J.; MEIRELES, T. y CARTAS, J. (1984). *Manual de prácticas de Parasitología* (tomo I). ISCAH.

DRUGUERI, L. (2005). *Macracantosis*. Macracanthorhynchus hirudinaceus. Extraído en noviembre de 2005, desde http://www.zoetecnocampo.com/forog/Forum9/HTML/000210.html.

LABIOFAM (2002). *Vademecum de productos farmacéuticos* (2da ed.). La Habana, Cuba: Group Empresarial Labiofam.

GUPTA, R. C. (2007). Ivermectin. Pharmacokinetics/Toxicokinetics. En R. C Gupta. *Veterinary Toxicology: Basic and Clinical Principles*. Academic Press.

NILLES-BIJE, M. L y RIVERA, W. L. (2010). Ultrastructural and Molecular Characterization of *Balantidium coli* Isolated in the Philippines. *Parasitol Res.,106* (2), 387-94.

LAPAGE, G. (1993). *Parasitología veterinaria* (8 va impresión). México: Compañía Editorial Continental.

OLIVARES, J.; RODRÍGUEZ, J. G.; ESCOBEDO, I. A.; CAMACHO, J. C.; HERRERA, H. A; MONTIEL, D.; FIERRO, A. y RUÍZ, D. (2010). *Evaluación del Albendazol y Praziquantel contra* Thysanosoma actinioides (*cestode*: anoplocephalidae) *en ovinos*. Extraído en febrero de 2010, desde http://scielo.sld.cu/scielo.php?pid=S0253-570X2010000100008&script=sci_arttext.

ORTEGA, L. M. (2002). *Programas de desparasitación en porcino, valoración y eficacia*. Extraído en diciembre de 2004, desde http://www.revista-anaporc.com/selejun1.htm.

PÉREZ, G. (2006). Agentes anticestódicos (tomo I, capítulo 20). En *Farmacología Veterinaria*. Producciones gráficas cooperadas ENPSES-MERCIE GROUP.

PÉREZ, H. (2009). *Prevalencia y eficacia antinematódica frente a* Macracanthorhynchus hirudinacius, *en cerdos de crianza privada*. Informe investigativo de salud y explotación porcina.

POMAJBÍKOVÁ, K.; PETRTHCTIELKOVÁ, K. J.; PROFOUSOVÁ, I.; PETRÁTHAROVÁ, J. y MODRY, D. (2010). Discrepancies in the Occurrence of Balantidium coli Between Wild and Captive African Great Apes. *J. Parasitol*, *96* (6), 1139-44.

SPSS (2006). Programa estadístico SPSS (versión 15.0) para windows.

RODRÍGUEZ, J.; ALONSO, MAGALI; BLANDINO, TERESITA; ABREU, RAQUEL y GÓMEZ, E. (1987). *Manual de técnicas parasitológicas*. Ediciones ENPES.

RODRÍGUEZ, V.; ORTEGA, A.; MACHAIN, C. y SANTOS, R. (2001). *Parásitos gastrointestinales en marranas mantenidas en dos sistemas de producción, interior y exterior, en el trópico mexicano*. Extraído en mayo de 2005, desde http://www.cipav.org.co/lrrd/lrrd13/5/rodr135htm.

RUBILAR, L.; DONOSO, S.; DÍAZ, L.; GODOY, C.; MUÑOZ, L. y PÉREZ, R. (2001). Eficacia antihelmíntica de tres endectocidas administrados por vía oral en caballos. *Arch. med. vet., 33* (1).

SÁNCHEZ, C.; QUÍLEZ, L.; CACHO, E. y LÓPEZ, F. (2004). *Coccidiosis porcina*. Extraído en junio, desde http://www.exopol.com/general/circulares/181.html

SHOOP, M. y SOLL, M. (2002). Chemistry, Pharmacology and Safety of the Macrocyclic Lactones. En J. Vercruysse y R. S. Rew (Eds). *Macrocyclic Lactones in Antiparasitic*. New York: CABI Publishing.

SOLAYMANI-MOHAMMADI, S.; MOBEDI, I.; REZAIAN, M.; MASSOUD, J.; MOHEBALI, M.; HOOSHYAR, H.; ASHRAFI, K. y ROKNI, M. B. (2003). Helminth Parasites of the Wild Boar, Sus scrofa, in Luristan Province, Western Iran and their Public Health Significance. *J. Helminthol.*, *77* (3), 263-7.

UPTON, S. (2004). *Animal Parasitology*, Macracanthorhynchus hirudinaceus. Extraído en abril de 2005, desde http://www.ksu.edu/parasitologylaboratory/macracanthorhynchus.htm.

VEGA, M. (2004). *Tratamiento de la demodeccia con Uncaria tomentosa*. Extraído en febrero de 2005, desde http://www.portalveterinaria.com/sections.php?op=viewarticle&artid=160.

Received: 20-9-2012
Accepted: 21-10-2012

Table 1 Significance of U Mann-Whitney test in the treatments used against *Macracanthorhynchus* sp.

Treatment	U Mann-Whitney	Significance
Group 1 levamizole Group 2 Labiomec	652.0	0.000
Group 1 levamizole Group 3 Praziquantel	834.5	0.004
Group 2 Labiomec Group 3 Praziquantel	1 206.0	0.761

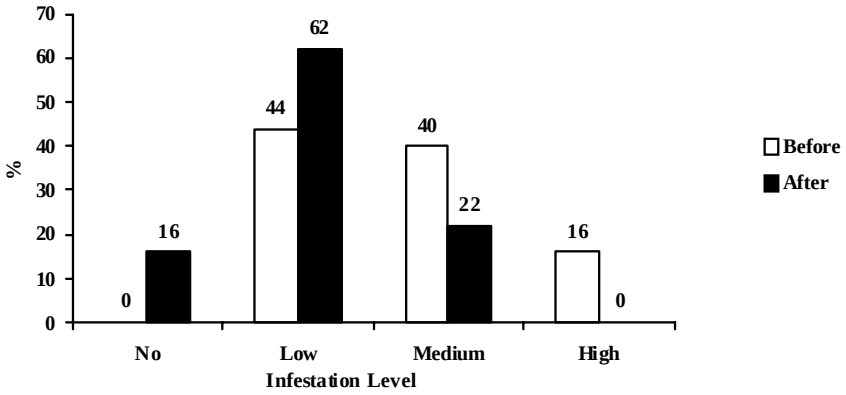

Fig. 1. Infestation level by *Macracanthorhynchus*, before and after therapy with levamizole

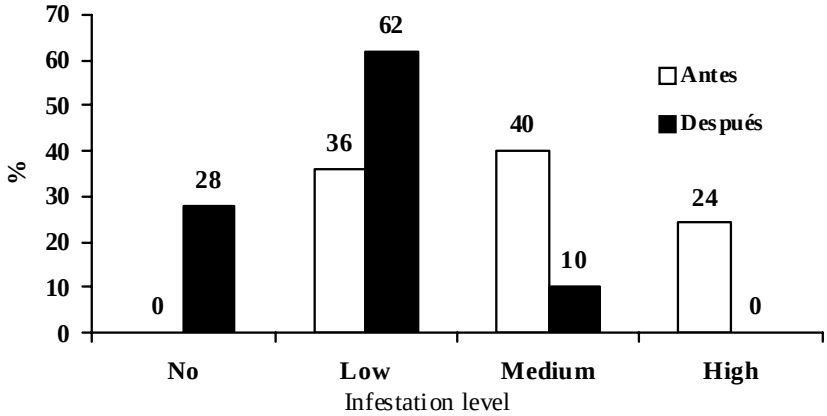

Fig. 2. Infestation level by *Macracanthorhynchus*, after and before of therapy with Labiomec®.

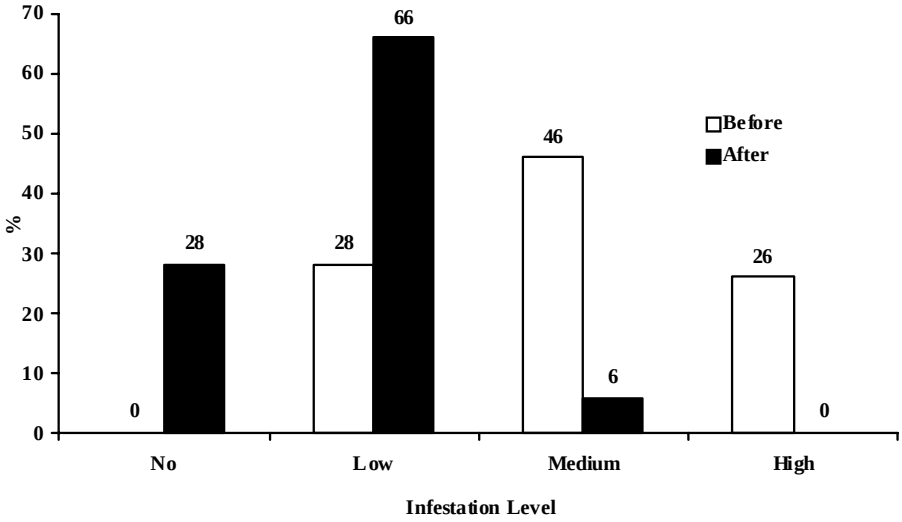

Fig. 3. Infestation level by *Macracanthorhynchus*, before and after therapy with praziquantell